

Clean Bay Strategy

SOUTH BAY WATERSHED ACTIVITIES

STATUS REPORT

JULY 2003

SAN JOSE/SANTA CLARA
WATER POLLUTION
CONTROL PLANT

Administered by the Environmental Services Department, City of San José

TRIBUTARY AGENCIES:

Cities of: San José, Santa Clara and Milpitas • Cupertino Sanitary District
West Valley Sanitary District—including Campbell, Los Gatos, Monte Sereno and Saratoga
County Sanitation Districts 2-3 • Sunol and Burbank Sanitary Districts

The City of San Jose manages the San Jose/Santa Clara Water Pollution Control Plant (Plant) for the Cities of San Jose, Santa Clara, Milpitas, Cupertino Sanitation Districts 2-3, Sunol and Burbank Sanitary Districts and West Valley Sanitation District (Campbell, Lost Gatos, Monte Sereno, and Saratoga) as shown above. The Plant is located at the southern end of one of the most important estuaries in the United States and receives discharge from over 1.4 million residents and more than 16,000 commercial and industrial facilities, including the leading companies of Silicon Valley.

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ABBREVIATIONS AND UNITS OF MEASURE

<i>Action Plan</i>	<i>Revised South Bay Action Plan</i>
ADWEF	Average Dry Weather Effluent Flow
BACWA	Bay Area Clean Water Agency
BAPPG	Bay Area Pollution Prevention Group
BASMAA	Bay Area Stormwater Management Agencies Association
Bay	San Francisco Bay
BMP	Best Management Practice
CBS	Clean Bay Strategy
CEP	Clean Estuary Partnership
City	City of San José
ESD	Environmental Services Department
FAS	Flow Audit Study
FY	Fiscal Year
GW	Groundwater Infiltration
IPM	Integrated Pest Management
JPA	Joint Powers Authority
IU	Industrial User
IWRP	Integrated Water Resources Plan
NPDES	National Pollutant Discharge Elimination System
P2	Pollution Prevention
Plant	San Jose/Santa Clara Water Pollution Control Plant
PMP	Pollutant Prevention and Minimization Program
POTW	Publicly Owned Treatment Works
Regional Board	California Regional Water Quality Control Board, San Francisco Bay Region
RMP	Regional Monitoring Program
SBWR	South Bay Water Recycling
SFSU	San Francisco State University
SOP	Standard Operating Procedure
South Bay	San Francisco Bay, South of Dumbarton Bridge
SSO	Site Specific Objective
State Board	California State Water Resources Control Board
TMDL	Total Maximum Daily Load
Tributary Agencies	Cities and Agencies Tributary to the Plant: San José; Santa Clara; Milpitas; Cupertino Sanitary District; West Valley Sanitary District – Campbell, Los Gatos, Monte Sereno, and Saratoga; County Sanitation Districts 2 and 3, and Sunol and Burbank Sanitary Districts
ULFT	Ultra-Low Flush Toilet
Urban Runoff Program	Santa Clara Valley Urban Runoff Pollution Prevention Program

ABBREVIATIONS AND UNITS OF MEASURE

U.S. EPA	United States Environmental Protection Agency
Water District	Santa Clara Valley Water District
WEP	Water Efficiency Program
WET	Water Efficient Technologies
WMI	Santa Clara Basin Watershed Management Initiative

UNITS OF MEASURE

ccf	hundred cubic feet
gpd	gallons per day
LF	linear feet
mgd	million gallons per day
ppb	parts per billion
ppd	pounds per day (lbs/day)
ppt	parts per trillion



INTRODUCTION

The National Pollutant Discharge Elimination (NPDES) permit currently governing the San José/Santa Clara Water Pollution Control Plant's (Plant's) wastewater discharge has been extended past the June 2003 expiration date to allow time to finish negotiations for the next permit. This year-long stakeholder-based negotiation process has resulted in acceptable resolution of more than a dozen key issues in the three South Bay Discharger's (San José/Santa Clara Water Pollution Control Plant, Donald S. Somers Water Pollution Control Plant in Sunnyvale, and Palo Alto Regional Water Quality Control Plant) permits. The remaining items that are still being discussed are the need for copper and nickel effluent limits, a dioxin special study, mercury interim mass limits, and historic habitat and flow issues. The schedule for adopting new permits is August or September 2003.

This report is the final report under the current permit and covers activities between January 1, 2003 to June 30, 2003 under Permit Order 98-052, amendments 00-108 and 00-109. The report is structured into two distinct sections: San Jose Action Plan elements and the Pollutant Prevention and Minimization Program summary. The report is being formatted in this manner to reflect future permit requirements and to facilitate review by California Regional Water Quality Control Board,

San Francisco Bay Region (Regional Board) staff.

The previous report (January 2003) included a detailed review of permit accomplishments from 1998 to 2002, as well as a description of the City of San José's (City's) NPDES permit strategy. This report is primarily focused on a review of accomplishments for the last 6 months and plans for the next reporting period.

ACCOMPLISHMENTS DURING 2003

Pollutant Prevention & Minimization Program:

The Plant has maintained compliance with all of its discharge limits and received the Association of Metropolitan Sewerage Agencies Gold Award for 100 percent compliance in 2002. Copper and nickel loading from permitted Industrial Users remain below the 1997 baseline levels for the sixth 12-month monitoring period in a row and the City continues to actively participate in the development of regional pollution prevention strategies and messages.

Action Plan Program Update:

Construction on the recycled water Silver Creek pipeline began in May 2003 and is on schedule. This 10-mile extension will primarily serve the Metcalf Energy Center and is anticipated

to deliver up to 5 mgd during the summer months. In May 2003, the Plant began a six-month pilot study comparing alternative methods of removing dissolved solids from recycled water. The study is jointly funded by grants from the US Bureau of Reclamation, the Santa Clara Valley Water District (in cooperation with the Metropolitan Water Districts of Southern California and the California Energy Commission) and the WaterReuse Foundation. The pilot study is expected to be completed in March 2004.

Other watershed programs:

The Santa Clara Basin Watershed Management Initiative (WMI) has nearly completed its Watershed Action Plan that is scheduled for adoption by the City in September 2003. The City has continued its active participation in the WMI core group and subgroups including funding the first completed draft of the Watershed Action Plan that is now being revised.

NEXT STEPS

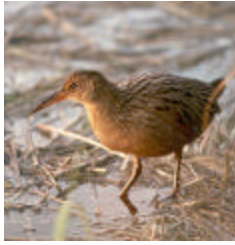
Once the new permit has been adopted, the City will develop an implementation plan to track individual requirements and to set up compliance reporting in an efficient manner. Based on requirements and monitoring agreed on to date, the following areas will be the focus for the next reporting period:

- Implementation plan and reporting
- Development of an updated South Bay Action Plan workplan that includes the key elements required in the new permit.

- Continued implementation and improved reporting for Copper and Nickel Action Plans
- Implementation of mercury strategy
- Implementation of pesticide strategy
- Participation in regional habitat improvement projects such as salt pond restoration and continue support for WMI

Clean Bay Strategy (CBS) Reports, as well as other studies and information related to South Bay issues, may be found on our website: <http://www.ci.san-jose.ca.us/esd/>

Any questions about this report may be directed to the Environmental Services Department, Watershed Protection, at (408) 945-5121.



CHAPTER 1

SOUTH BAY ACTION PLAN

In 1990, the California State Water Resources Control Board (State Board) asserted that the Plant discharge converted salt marsh to either fresh or brackish marsh, thereby threatening the habitat of two endangered species, the salt marsh harvest mouse and the California clapper rail.

As a result, the State Board ordered San Jose, as the administering agency for the Plant, to implement actions to protect the marsh from conversion by limiting flows to below 120 mgd average dry weather effluent flow¹ or to flows that would not further impact endangered species, and to submit a mitigation proposal involving the creation or restoration of 380 acres of wetlands or equivalent habitat. In 1991, the original Action Plan was proposed by the City to meet regulatory requirements.

The Action Plan included water recycling, water conservation (residential, commercial, and industrial), and marsh mitigation. In October 1993, the Regional Board incorporated the Action Plan into the NPDES permit for the Plant. Despite significant progress in implementing the 1991 Action Plan, Plant discharge averaged 132 mgd in 1996, probably due to the emergence of the Santa Clara Valley from a combination of

drought and economic recession. The Regional Board held a public hearing in December 1996 and directed the City to revise its Action Plan. The revised *South Bay Action Plan (Action Plan)* was submitted in June 1997, and the Regional Board amended the Plant's NPDES permit to include the *Action Plan* in August 1997. The *Action Plan* included the Water Efficiency Program, South Bay Water Recycling, Industrial Water Recycling and Reuse, Groundwater Infiltration Reduction, and Environmental Enhancements.

GOALS OF HABITAT PROTECTION AND FLOW REDUCTION PROGRAM

- Protect beneficial uses of endangered species habitat of South Bay.
- Provide sound science to understand factors affecting marshes in the South Bay.
- Coordinate with regional wetlands protection and restoration efforts.
- Remain in compliance with all permit requirements

TIDAL MARSH HABITAT ASSESSMENT (FORMERLY SALT MARSH CONVERSION ASSESSMENT)

In 1989, as part of a monitoring program required by the Regional Board, the City commissioned a detailed study of the marshes potentially affected by the freshwater discharge from the Plant. Subsequent mapping studies were

¹ The ADWEF is defined in Board Order WQ90-5 as "the lowest average effluent flow for any three consecutive months between the months of May and October".

conducted in 1991, 1994, and annually thereafter. These aerial studies document changes in the distribution and extent of salt, brackish and freshwater marsh.

The tidal marsh vegetation will next be mapped and characterized by habitat type in 2003. No new data has been generated since the January 2003 *CBS Report*. The reports are available at the Environmental Services Department's (ESD's) web site (<http://www.ci.san-jose.ca.us/esd>) under "Publications and Research", as *Marsh Plant Associations of South San Francisco Bay: (Year) Comparative Study*

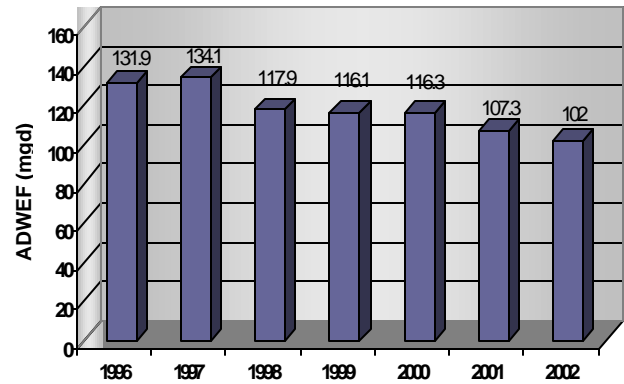
MARSH MITIGATION

Restoration of the Moseley Tract has not occurred because issues regarding storm water runoff from, and flood protection for, the Dumbarton Bridge infrastructure have not yet been resolved. The City is considering an alternative project that would resolve the Moseley Tract issue.

Revised South Bay Action Plan Programs

In 2002, upon the completion of the *Action Plan*, the Average Dry Weather Effluent Flow (ADWEF) from the Plant was 102 mgd. As shown in Figure 1, this marks the fifth consecutive year in which the Plant's flows have remained below 120 mgd. The dramatic flow decrease in the last two years indicates that the slowdown in the economy has also likely played a role, in addition to the success of flow reduction activities.

Figure 1: Plant Dry Weather Flows, 1996 - 2002



Water Efficiency Program

The Water Efficiency Program (WEP) continued to utilize the successful indoor water conservation strategies employed during the 1997-1998 *Action Plan* to achieve additional influent reductions of 0.37 mgd between July 2002 and June 2003, including 0.14 mgd achieved since January. Flow reduction strategies focused primarily on piloting a new Direct-Ship Ultra-Low Flush Toilet (ULFT) program, shipping new ULFTs directly to participating single-family homeowners to replace older, less water efficient toilets in the Tributary area of the Plant. Implementation of this program began in February 2003. Between February and June, approximately 2898 ULFTs were distributed through this program.

Through its cost sharing agreement with the Water District, WEP provided funding for horizontal-axis washing machine rebates, business, multi-family and low-income ULFT retrofits,

residential home water audits, commercial washer rebates, and other commercial opportunities such as water efficient pre-rinse sprayer installations. WEP also co-sponsored a foodservice and hospitality workshop on May 12, 2003, to highlight water conservation opportunities in the hotel/restaurant commercial sector. Forty-four participants attended the event.

WEP participated in several outreach events in 2003 to promote indoor water conservation and raise awareness of the South Bay water issues in. WEP attended, bringing literature and materials, the Home and Garden Shows in January and May, the Tri-County Apartment Association Expo in March, and the “Greening Your Business” workshop, also in March. WEP sent literature and materials to other events, including the Master Gardener’s meeting in April, Lincoln High School’s Earth Day event in April, the Silicon Valley Business Expo in June and the Community Resource Fair in June. Key messages for these events included replacing older toilets, finding and repairing leaks – including toilet flapper leaks, promoting water efficient process and equipment changes, conserving water, and raising awareness about water issues in the South Bay.

ESD’s website provides outreach on the Direct-Ship ULFT program, including a downloadable application form. The website also registered participants for the Foodservice and Hospitality workshop and is a convenient place for visitors to find information on many water-related topics.

In preparation for the 2003-2004 Dry Weather Campaign (May-October), WEP went through an extensive planning process and found it challenging to identify a specific action-oriented campaign message that met current program needs. Since research indicates that leaks represent a significant source of water use and toilet flappers represent a significant segment of those leaks, toilet flapper valve replacement would appear to be a likely subject of an outreach campaign. However, other research has indicated that improper toilet flapper valve replacement in ULFTs could jeopardize the savings they achieve. Therefore, the City decided to do additional research to determine the most effective outreach strategy before proceeding with any flapper valve replacement programs. Currently WEP staff is also working to identify leveraging opportunities with other agency outreach campaigns to raise awareness and educate residents about indoor conservation and the South Bay habitat protection issue.

In fiscal year 2003-2004, WEP plans to continue its Direct-Ship ULFT program, as well as continue to explore flow savings opportunities other than toilets in the Commercial sector. WEP will also continue to support District indoor conservation programs as appropriate to meet WEP flow reduction goals. WEP is also working with the California Urban Water Conservation Council to research how flappers, leaks, and flapper repair can affect water use.

South Bay Water Recycling (SBWR)

SBWR provides recycled water for landscape irrigation and industrial uses in San José, Santa Clara, and Milpitas. The goal of the program is to cost-effectively reduce treated freshwater flow to the southern end of San Francisco Bay, and to provide a reliable, drought-proof supply of recycled water for the benefit of the community.

Recycled water usage for the first half of 2003 (through May) averaged 3.1 mgd, down 16% from 2002 usage. This was primarily due to an unusually cool, wet spring that reduced combined April and May 2003 use (4.5 mgd) by nearly 30% compared to the same period in 2002 (6.2 mgd). However, January through March usage was 14% higher than the previous year, suggesting that non-irrigation base flows increased as a result of connecting an additional 40 customers to the system, and demand during the highest three consecutive dry-weather months is still projected to exceed last year's average usage of 10.0 mgd. In addition, dry weather effluent flows to the Bay are expected to be less than 120 mgd for the sixth consecutive year.

During the past six months (January 1 to June 30, 2003), five additional landscape irrigation sites have been connected, bringing to 12 the number connected since the last dry weather season. One customer (Los Esteros Critical Energy Facility) is expected to use up to 0.8 mgd for cooling during the hottest summer months. Other recently connected sites include Santa Clara University and the Evergreen Valley High School. The addition of these sites brings the total number of SBWR customers to 404.

Construction on the Silver Creek pipeline began in May 2003 and is on schedule for completion by the end of the calendar year. This 10-mile 30"-diameter pipeline extension will primarily serve the Metcalf Energy Center and is anticipated to deliver up to 5 mgd during the summer months. The project is jointly funded by the City, Calpine, Inc., the Water District, and the State Water Resources Control Board.

In May 2003, electrodialysis and reverse osmosis water treatment equipment was delivered and installed at the Transmission Pump Station site at the San Jose/Santa Clara Water Pollution Control Plant. The equipment will be used in a six-month pilot study comparing alternative methods of removing dissolved solids from recycled water to enhance its reuse potential. The study is jointly funded by grants from the US Bureau of Reclamation, the Water District (in cooperation with the Metropolitan Water Districts of Southern California and the California Energy Commission) and the WaterReuse Foundation. The pilot study is expected to be completed in March 2004.

Outreach for SBWR has focused on informing and updating residents, businesses and commuters of the recycled water pipeline extension program in the Silver Creek area and to address calls and concerns from the public in a timely manner. A direct mail piece was produced and mailed to approximately 6,000 residents living in the Silver Creek area. It contained information about SBWR and its benefits, the reason for expansion, construction timelines, and impacts.

Additional outreach included: print advertisements in local newspapers, taglines in local radio stations, weekly website updates on construction status, and coordination and training for City's call center.

Future SBWR outreach includes:

- planned distribution of the annual water quality report to all customers
- the demonstration garden project at Guadalupe Gardens
- a winter newsletter
- a fact sheet on irrigating redwood trees.

SBWR Collaborative Effort with the Water District

In January 2002, the City Council and the Water District Board approved an Agreement to work jointly on both a short-term recycled water pipeline project and long-term recycled water partnership. The short-term component of the Agreement involved funding the pipeline that is being built into the Coyote Valley to serve 3-5 million gallons per day of recycled water to the Metcalf Energy Center. The contract for construction of the Silver Creek pipeline was awarded in April 2003. Construction began in May 2003 and is scheduled to be completed in December 2003. At the same time, there were monthly stakeholder meetings to determine preferred alternatives for the operation and management of SBWR. The outcome of these discussions was summarized and presented to City Council and the Water District Board jointly in January 2003.

At the second joint City Council/Water District Board meeting held in January

2003, the Council and Board considered the progress of the SBWR Collaborative Effort. At that meeting, the Board and Council directed staff to:

- Report back in three to four months with a comparison of the pros and cons of moving forward with either a new Joint Powers Authority (JPA) or a long-term comprehensive agreement between the Treatment Plant Joint Powers Authority and the District related to operation of the SBWR system, and a proposal for steps to be taken beyond those recommended.
- Continue work on the necessary negotiations to expeditiously implement such an agreement.
- Include a plan determining appropriate water quality.
- Ensure that the implementation of the negotiation includes a plan for communication with the public regarding the value and safety of recycled water.
- Provide information on the budget impacts of each recommendation as information becomes available.

Comparison Of New JPA And Long-Term Agreement

The SBWR Collaborative Technical Advisory Committee met in March 2003 to review the analysis of the advantages and disadvantages of establishing a new JPA versus developing a long-term comprehensive agreement. The analysis was based on a review of five existing agreements among similar agencies with similar purposes in Monterey County, Orange County, Alameda County, and

Los Angeles County. The key issues that distinguish the two options are:

- Need for separate governance.
- Need for functions that are not fulfilled by either agency.
- Identification of expected recycled water and facilities needs to be addressed by the agreement.

Based on the comparison between the two options, and given that the City and the Water District are clearly able to provide all the capabilities needed for the implementation of future projects, the Committee concluded that the objectives of the Collaborative Effort, as presented in January 2003, could be successfully accomplished with a long-term agreement without the creation of a new agency. They further recognized that, should circumstances warrant a change, a long-term agreement could later be used as the basis for forming a JPA. This conclusion was reported to the City Council and the Water District Board on May 20, 2003. The City Council and the Water District Board directed staff to continue working on a long-term agreement.

Negotiations on a Long-Term Agreement

Specific steps have been identified to develop the outline of terms and conditions that would comprise a long-term, comprehensive agreement for long-term operations and maintenance of the SBWR system. The agreement would be between the Plant Joint Powers Authority (the Plant is owned by the cities of San José and Santa Clara and managed by the City of San José) and

the Water District. The next key steps, which are underway, are:

- Finalization of the Water District's Integrated Water Resources Plan.
- Review and update, as necessary, of the Water District's Ends Policies (The Ends Policies describe the intended results of Water District efforts).
- Identification of expected recycled water use and facilities needs to be addressed by the agreement.
- Determination of appropriate water quality for various uses.
- Determination of funding sources and responsibilities.

The Water District is in the process of finalizing their Integrated Water Resources Plan (IWRP). The IWRP is used as a fundamental planning tool for determining the mix of water sources to be used to ensure a reliable water supply in Santa Clara County. On August 19, 2003, the Water District Board will review and update their Ends Policies to reflect how recycled water helps the Water District meet its goals and to ensure that the proposed next steps are compatible. When this planning process is complete, the Water District will be better able to determine how much recycled water they need, where they need it, and which facilities are necessary to fulfill those needs.

In addition, the Water District is currently studying advanced treatment options and the Plant has just begun an advanced treatment pilot study. The results of those studies should be available in six to nine months. Those results will quantify the cost of various

water quality options as well as providing information as to what treatment(s) may be necessary to facilitate additional uses of the water.

Finally, given the current economic climate, it is necessary to determine whether further expansion of the recycled water system is the highest priority in a time of tight resources.

Therefore, the next major steps in the negotiation process will occur in the fall of this year. Given that the Plant is unlikely to have flow concerns for the next five years and the Water District's long range planning shows no immediate need to accelerate the use of recycled water, the opportunity exists to consider all of these special studies as part of determining the best solution for all parties and for the residents of Santa Clara County.

Industrial Water Recycling and Reuse

The focus of Industrial Recycling and Reuse efforts has been to ensure that Industrial Users in the Plant's service area reduce the use of potable water, recycle their own wastewater, and/or use SBWR recycled water to the maximum extent practicable. Programmatic efforts for Industrial Reuse have included technical seminars, facility audits, and financial incentives.

Nine Flow Audit Studies (FAS) were approved by the end of April 2003. Six projects have been completed as a result of these FAS with a total reduction to the sanitary sewer of approximately 45,000 GPD.

The FAS protocol is being converted into a guideline that can be used as a

resource by companies interested in saving water. It will summarize control measures that are normally applicable and cost effective in industrial applications. The information will be made available to all companies, especially those discharging over 25,000 gpd, in conjunction with Water Efficient Technologies (WET) contacts. The information is expected to be ready for distribution by the end of 2003.

Copies of the *Guidelines for Managing Water in Cooling Systems* were distributed to the largest industrial water users (all 43 of the companies completing FAS in phase 1 or 2) in May 2003.

Draft Industrial Wastewater Reuse Guidelines were completed in March. The Guidelines will be converted into a draft publication through a contract with a graphic artist. Expected final publication of the Guidelines is the end of 2003.

Water Efficient Technologies (WET) is a financial incentives program that provides rebates to companies that reduce sanitary sewer discharge by implementing equipment and/or process changes. The program was established in 1991 and offers one-time rebates based upon amount of flow saved. The rebate is calculated at a rate of \$4 per every ccf/year of wastewater reduced, up to 50% of documented project costs with a maximum of \$50,000 per project. Depending upon the hours of operation, the rebates typically range from \$1.50 to \$2.00 for every gpd saved.

No WET projects were completed in the first half of 2003. The WET program has recently approved 5 applications from Intel Corporation of Santa Clara for a large industrial reuse project. Intel plans to treat Reverse Osmosis reject water for use in air scrubbers in four separate buildings and increase efficiencies in two cooling towers. The projects are estimated to save over 105,000 gallons per day in discharge. Intel plans to begin installation this summer and complete by late 2003. In addition, several other companies are currently in the planning stages of flow reduction projects.

The WET program is participating in a grant program for water audits managed by the Water District. The Water District was awarded a grant from the California Department of Water Resources to perform water audits of industrial, institutional and commercial in Santa Clara County. The audits are being performed by a third-party consultant and are free of charge to businesses. One of the main goals of the audits is to assist companies in identifying wastewater reduction projects and encourage application to WET projects. While the program has just started, early feedback has indicated several companies are interested.

Outreach to the industrial and commercial sectors included:

- Two Industrial User Academy sessions (March 26 & 27 and April 30 & May 1)
- The Spring Industrial User Newsletter which included information on WET and WEP programs

Groundwater Infiltration Reduction

To reduce extraneous flows into the sanitary sewer system and ultimately through the Plant and into the South Bay, the City and tributary agencies have located and quantified sources of dry weather groundwater infiltration (GWI) into tributary area sewers and have rehabilitated the sewer system as appropriate to reduce GWI.

The GWI reduction program financed an overall infiltration study, conducted by the City and its tributary agencies, and three original construction projects were completed. These projects resulted in a reduction of GWI of approximately 3.1 mgd. Three additional projects were identified and are described below. Pending flow monitoring results, the two recently completed projects are estimated to result in an additional 1.4 mgd of influent reduction.

Current GWI correction projects include:

Reconstruction Of Manhole On Santa Teresa Boulevard At Bailey Avenue:

This project provided the replacement of an existing leaky junction box that was identified to contribute 1 to 2 mgd of GWI. This junction box reconstruction is part of a sewer tunnel project that was delayed but re-activated in June 2002. The manhole reconstruction has been completed and additional flow monitoring data will be collected in July 2003 to determine the actual reduction in GWI.

Redmond Avenue Parallel Sewer Rehabilitation:

This project involved cured-in-place liners of 3,500 linear feet (LF) of 15-

inch, 2,400 LF of 24-inch and 1,150 LF of 27-inch trunklines, along with rehabilitation of 25 manholes and a number of laterals within the right of way. These trunk sewers, located between Camden Avenue and Cloverhill Drive, were identified to contribute up to 2 mgd of GWI. The project has been completed and additional flow monitoring data will be collected in July 2003 to determine the actual reduction in GWI.

Trade Zone Boulevard at Montague Expressway Sewer Rehabilitation:

This project is scheduled to begin in September 2003. It involves the rehabilitation of 18 manholes and 5,400 LF of 24-inch trunk sewer. The manholes and sewer line, located along Trade Zone Boulevard, were identified to contribute an unknown amount of GWI.

New Projects

Several areas in San Jose are currently under investigation. If these areas are found to have significant quantities of groundwater infiltration, corrective work will be implemented, and rehabilitation of them will result in additional reduction of flow to the Plant.

Environmental Enhancements

Due to the challenges encountered in implementation, including temperature control costs, facility siting, and permitting, these projects are currently on hold.

Other Related Efforts

Avian Botulism Program:

The Plant has monitored Avian Botulism since the early 1990s. Study areas focus on tidal areas under influence of fresh

and brackish water. Typically, surveys are conducted by boat, car, and foot between the months of June and November. There was no evidence of avian botulism in 2002 or in 2003 to date. The City will continue to collect information on avian botulism and is working with the San Francisco Bay Bird Observatory to create a regional Global Information System view of the South Bay to track avian botulism outbreaks. The development of a regional database will allow for better temporal and spatial analysis of the disease.

Development Review:

ESD provides review of proposed developments within the City of San Jose. For this reporting period, ESD provided review and information on recycled water for 40 projects, water efficiency for 10 projects, and reviewed 11 Environmental Impact Reports.

Program Evaluation

The *Action Plan* programs have been successful in reducing flows to below the ADWEF trigger of 120 mgd for the last five years. Marsh studies indicate that more salt marsh habitat exists now than in 1989 and that marsh changes are the result of multiple factors. The City will continue its leadership in protecting the habitat of the South Bay and intends to become an active stakeholder in the State/Federal effort to purchase and restore Cargill salt ponds.

Some of the current *Action Plan* programs, such as sewer rehabilitation and water conservation may be reaching a point of diminishing returns, while new opportunities for wetlands restoration could directly benefit the regulatory intent of the *Action Plan* to protect and

restore endangered species habitat. An updated *Action Plan* will be submitted in February 2004.

Recommended Activities

The City will continue implementation of flow reduction programs, including water recycling, conservation, groundwater infiltration reduction, and industrial recycling and reuse. By February 28, 2004, the City will submit a workplan for next year's *Action Plan* programs. In addition, the City will continue its marsh studies.



CHAPTER 2

POLLUTANT PREVENTION AND MINIMIZATION PROGRAM

The City has implemented programs to prevent adverse environmental effects from pollutants in discharges to the South Bay from the Plant as well as stormwater runoff. Pollutants specifically targeted are copper, nickel, mercury, and pesticides. Programs have included local as well as regional efforts. A description of the work done over the last six-month period is given in the following three sections: copper and nickel, mercury, and pesticides.

Copper and Nickel

In 1989, San Francisco Bay south of the Dumbarton Bridge (South Bay) was designated by the U.S. Environmental Protection Agency (U.S. EPA) as an impaired water body, under Section 304(l) of the Clean Water Act, due to anthropogenic inputs of seven metals, including copper and nickel. Municipal dischargers and stormwater runoff were designated as sources contributing to the impairment. In 1998, The Regional Board scheduled TMDLs for copper and nickel in the South Bay. The City funded, at a cost of over two million dollars, a South Bay stakeholder and technical process that resulted in the development of site-specific objectives (SSOs) and the Impairment Assessment

Report for Copper and Nickel in the Lower South San Francisco Bay (June 2002). The impairment assessment concluded that the South Bay was unlikely impaired for copper and nickel. The Regional Board recommended delisting copper and nickel from the state-wide 1998 303(d) list. The State Board adopted the revision on February 4, 2003 placing copper and nickel on the new Monitoring List. U.S. EPA approved the 2002 303(d) list on June 6, 2003.

As part of the adoption of SSOs, a Copper and Nickel Action Plan was developed through the Watershed Management Initiative as a Water Quality Attainment Strategy to ensure that ambient levels of copper and nickel are maintained. Required reporting elements of the Copper and Nickel Action Plan are listed in Appendix B, along with the location within this CBS Report that any updates are described.

Goals of Copper and Nickel Pollution Prevention Program

- Protect beneficial uses of South Bay from adverse impacts due to copper and nickel
- Use a watershed approach and focus on cost-effective solutions and priority sources of pollutants

- Implement Copper and Nickel Baseline Actions as part of the required Water Quality Attainment Strategy
- Monitor ambient conditions in the receiving water to measure changes

Watershed Sources

According to the Conceptual Model Report (Tetra Tech, December 1999), the two largest sources of total copper and nickel to the Lower South San Francisco Bay are sediment exchange during resuspension and non-point source loads from tributaries.

Effectiveness Measures

Plant influent and effluent as well as permitted industrial loading is monitored for upward trends (see Figures 2, 47). A self-imposed trigger is used for permitted industrial loading. If total permitted industrial loading exceeds the 1997 baseline year (used to measure copper and nickel source reduction efforts), an assessment will be done to identify reasons for the increase and appropriate activities will be developed to address the additional loading. Such activities may include, but are not limited to, a requirement for a discharger, or group of dischargers, to perform a self-audit to identify any additional uses of copper or nickel, including the investigation of applicable pollution prevention projects.

Source Identification

Data from individual permitted industrial dischargers is reviewed during the semi-annual loading calculation and any unusual changes can be investigated

by an Environmental Inspector or an Environmental Engineer. If necessary, site-specific surveillance will be done as part of the Pretreatment Program to identify non-compliant dischargers.

Bioassessment Studies

The Plant's NPDES Permit Order No 98-052 - Provision E.4 contained requirements to conduct bioassessment studies to develop additional tools and measurements for characterizing the water and sediment quality in the lower South Bay. In early 2000, the City collaborated with Regional Board staff and San Francisco State University (SFSU) scientists to produce a study plan for developing bioassessment techniques for San Francisco Bay's plankton community. This plankton bioassessment was envisioned as a two-phased, potentially four-year study to evaluate plankton community composition and abundance and possible covariance with water quality conditions, which could then possibly lead to site-specific environmental indicators for the South Bay. Since 2001, SFSU conducted seven quarterly sampling cruises and produced a Phase I report entitled *Plankton Communities in South San Francisco Bay: Historical Data Analysis and Pilot Monitoring*, submitted to a Technical Advisory Group and Regional Board staff on May 8, 2003. In addition, the City proactively supported an investigative effort to develop an alternative assessment methodology and techniques to define the "health" of the estuary. The resultant report, entitled *Evaluating the Ecological Condition of the South Bay: A Potential Assessment Approach*, was

submitted to the Executive Officer in August 2002. Based on completion of these various work products, the Regional Board issued a letter dated June 11, 2003 finding that the City of San Jose has met all requirements of NPDES Permit Order No. 98-052 – Provision E.4.

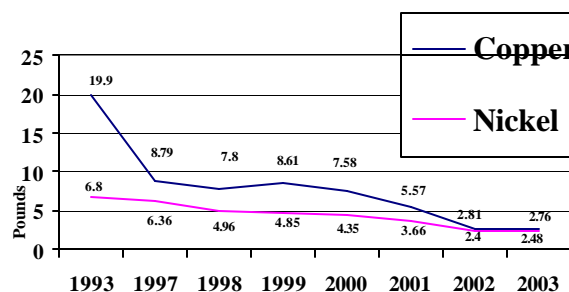
Copper Action Plan

The City is implementing the Copper and Nickel Action Plans, which include baseline activities for the Plant and Urban Runoff Program. The City and other dischargers hold periodic stakeholder meetings to review the status of the Copper and Nickel Action Plan activities. Additional meetings have occurred during this reporting period to try to resolve questions raised by the Regional Board regarding some baseline activities. Each applicable baseline activity is identified within this section under the appropriate heading.

In addition to the Action Plans, the Pollutant Prevention and Minimization Program (PMP) include Mass Audit Studies, Reasonable Control Measure Plans, and Best Management Practices. One new Mass Audit Study was received during this reporting period. It will be evaluated and, when deemed complete, a mass equivalent concentration limit for nickel will be given to the discharger as their local discharge limit.

Total permitted industrial loading of copper and nickel to the Plant continue to remain below 1997 baseline levels. See Figure 2.

Figure 2: Total Permitted Industrial Copper and Nickel Loading to the Plant



Other Activities

The City maintains ongoing communication and training for dischargers, including the Industrial User (IU) Academy and a periodic newsletter called the Tributary Tribune. The IU Academy educates IUs on the regulatory requirements of the Industrial Wastewater Pretreatment Program, the General Industrial Stormwater Permit, and other programs and procedures that may reduce the flow of pollutants to the South Bay. Staff is also welcome to attend the IU Academy to refresh their knowledge of the presented information.

With the continued unavailability of Plant tours, the video describing Plant operations is being updated. This video will be shown on the City government television channel, as well as being shown as part of the *Slow the Flow* classroom program. In addition, the San Francisco Bay Wildlife Society, through a grant from the City, has held educational programs at the Don Edwards Environmental Education Center in Alviso for the last four years. This educational program is now being

taken to high schools. Pilot lesson plans were prepared and presented beginning in April, with a goal of 25 classroom presentations for the next year.

The City remains active in the Bay Area Pollution Prevention Group (BAPPG) and Bay Area Clean Water Agencies (BACWA) regional pollution prevention and outreach development groups.

Staff updated existing materials, and worked on the following materials and projects addressing copper and nickel sources:

- *Guidelines for Managing Water in Cooling Systems* –the City
- *Copper Plumbing and the Health of the Bay – Guidelines for Plumbers* – the City (reprint)
- Bay area wide *Clean It* guide update and reprint – BAPPG
- Pool “sticker” project – proper disposal of swimming pool water – Urban Runoff Program
- *Good Plumbing Practices Protect San Francisco Bay – A Fact Sheet for Plumbers/Installers*- BAPPG (see Appendix C)
- *Preventing Corrosion Protects San Francisco Bay – A Fact sheet for Designers* – BAPPG (see Appendix C)

Monitoring Programs

Regional Monitoring Program

The City contributes to, and actively participates in, the Regional Monitoring Program, a region-wide assessment and monitoring program administered by the San Francisco Estuary Institute on behalf of the Regional Board. The City funds one additional sampling station in the southern end of the Bay.

Ambient Monitoring

Monthly monitoring continues for various water quality parameters, including copper and nickel, at 12 sampling sites in the extreme South Bay (see Figure 3). These sites represent deep channel, mid-channel, shallow mudflats, and areas of significant stream influence. This monitoring program provides fundamental information describing the spatial and temporal trends in water quality. This monitoring information also represents the basis for trigger levels in the Copper and Nickel Action Plans and their associated pollution control activities. Levels of dissolved copper and nickel have remained relatively constant and no *Action Plan* trigger levels have been exceeded. The 2003 data will be available after the last dry weather samples for the year are collected in November.

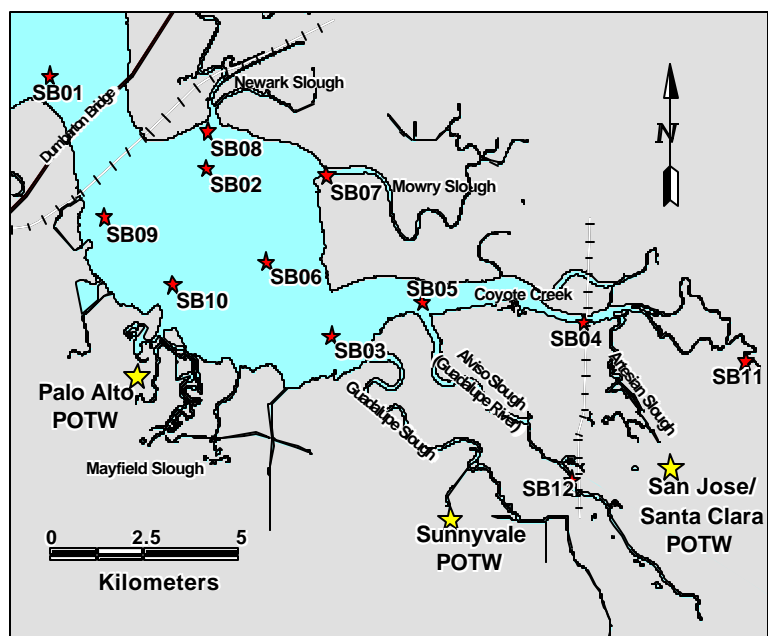
Figure 3: Ambient Monitoring Stations

Figure 4: Influent Copper to the Plant

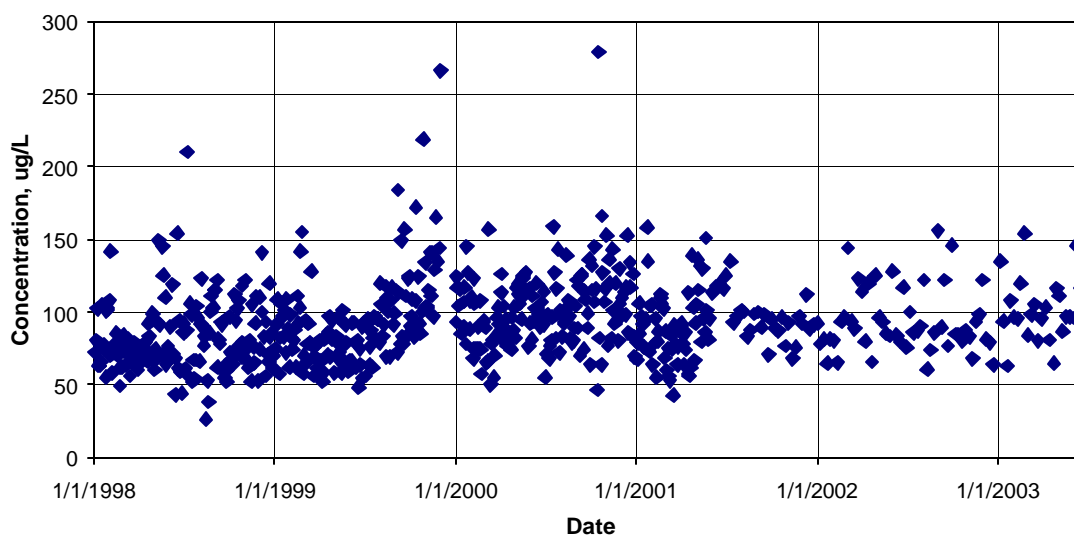


Figure 5: Effluent Copper from the Plant

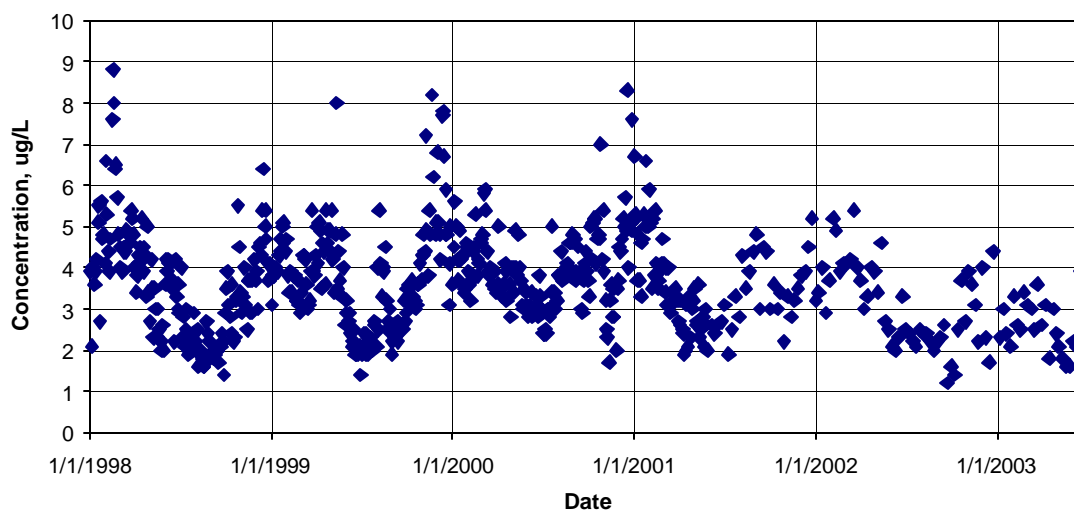


Figure 6: Influent Nickel to the Plant

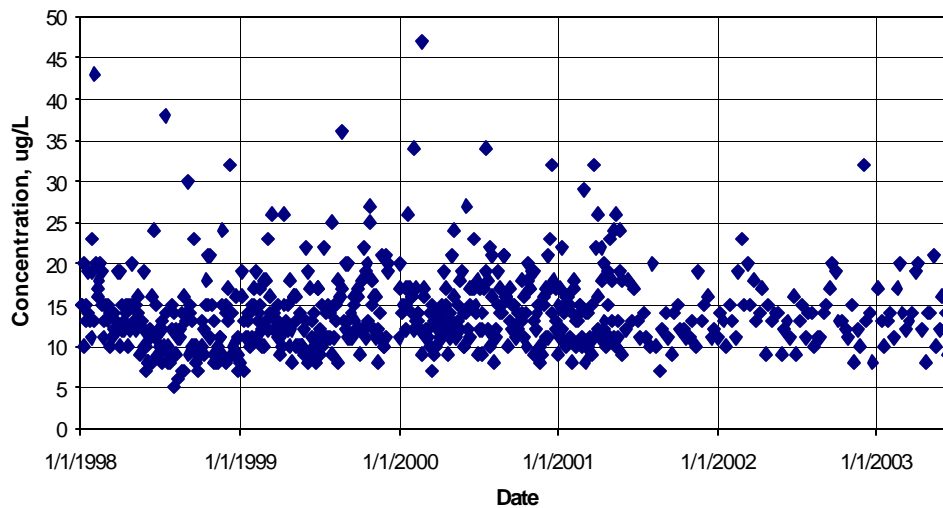
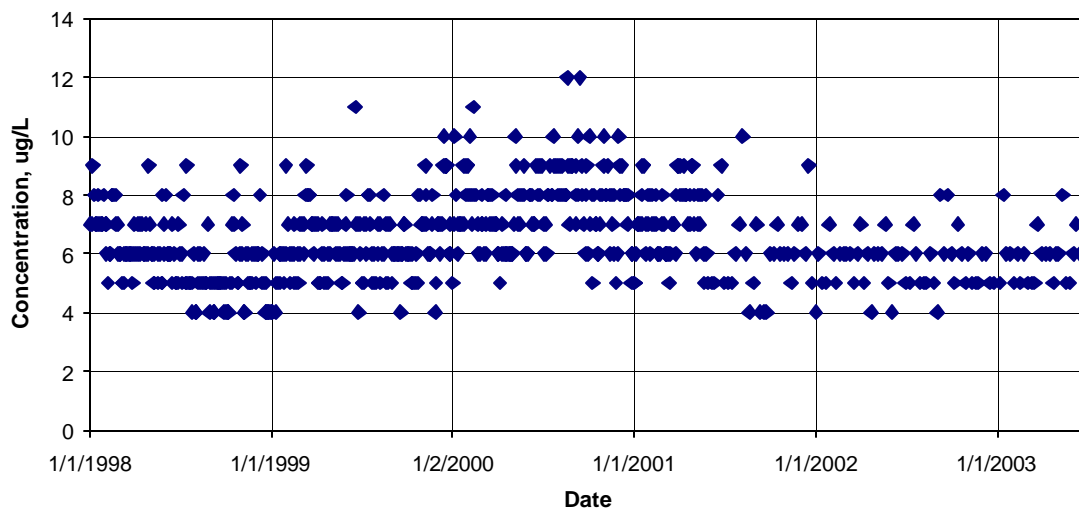


Figure 7: Effluent Nickel from the Plant



Mercury

The City's current Mercury Participation Plan includes the following objectives: (1) to continue low level effluent monitoring for mercury and (2) to participate in the Regional Board's region-wide mercury phased Total Maximum Daily Load (TMDL) investigation. The Regional Board accepted the proposal on January 13, 1999.

Sources

Mercury can be found in wastewater and stormwater. The Guadalupe watershed is the largest source of mercury to the South Bay due to runoff from abandoned mercury mines. Wastewater sources include hospitals and dental offices, however, municipal discharges contribute less than 1.5 percent of mercury to the South Bay (Regional Board Mercury in San Francisco Bay Total Maximum Daily Load Project Report, June 6, 2003). No additional sources of mercury have been identified.

Regional Participation in Special Studies:

Regional participation is accomplished as a principal member of BACWA, as well as co-chairing the CEP (a collaboration between treatment plants, urban storm water management agencies, and the Regional Board) to develop TMDLs and implement water quality attainment strategies. The Bay-wide Mercury TMDL should be completed in 2003 as part of the CEP.

Pollution Prevention and Source Control Activities

The Plant continues to maintain an average discharge concentration of 3 ppt for mercury. Regional pollution prevention and source control efforts have focused on dental offices, hospital/medical facilities, and household products. The City continues to focus on mercury reduction through regional outreach efforts and best management practices development.

During this report period, the City co-chaired BAPPG, which provides a forum for information exchange and regional projects. During this report period:

- BAPPG held a special session in which several programs around the Bay Area presented the specifics of their dental amalgam related activity. The contractor for BAPPG's dental amalgam project also addressed the group.
- BAPPG's dental amalgam workgroup distributed pre-prepared Powerpoint presentations to assist members with presentations to local dental organizations and dental facility staff.
- BAPPG's Spanish Radio Outreach project (managed by the City) prepared to deliver another round of pollution prevention messages to more than 200,000 daily listeners. Messages included 30 second and 15 second messages about proper disposal of residential household waste containing mercury.

Future Activities

As part of the stakeholder process for developing the next NPDES permits for the South Bay Dischargers, a South Bay mercury initiative was developed. Part of that initiative includes a total and methyl mercury fate and transport study at the Plant. A work plan will be developed and submitted within 120 days from permit adoption. This study will take place over several years in order to cover spatial and temporal variability. This study, along with the work from the other South Bay Dischargers, is expected to yield valuable data to support completion of the TMDL.

Staff will also develop a plan to present the BAPPG information at local dental association meetings within our tributary area.

Pesticides

The pesticides requiring monitoring by the Plant will change when the next permit is issued. Effluent limits were triggered by background levels in the South Bay. Many of the activities for this issue are implemented through the stormwater program. Highlights of activities for the first half of calendar year 2003 relating to pesticides are described below.

Sources

Pesticides and persistent bioaccumulative toxins enter the sanitary sewer system from a variety of sources, including washing of spray equipment and inappropriate disposal of excess product.

Activities

The City has developed Standard Operating Procedures (SOPs) and Best Management Practices (BMPs) that incorporate Integrated Pest Management (IPM) measures for its employees and contractors. This was done in accordance with the City's Pesticide Management workplan.

Training of City employees and contractors on IPM measures is planned for fiscal year (FY) 03-04. Starting with FY 03-04, as contracts are re-issued, the condition that contractors follow the City's IPM policy will be included in bid and contract specifications.

The City Council approved a broad Pollution Prevention (P2) policy on June 24, 2003. The new P2 policy specifically endorses the incorporation of IPM techniques into relevant City operations and practices.

Residents are encouraged to dispose of unused pesticide products at one of the three permanent sites located within the County. Notification occurs through utility bill inserts, flyers at outreach events, door hangers in under-served communities, posters at multi-family dwellings as well as through the Watershed Watch Campaign developed in conjunction with the WMI and the Urban Runoff Program. The City supports "Our Water, Our World", the regional integrated pest management partnership effort in which Bay Area Stormwater Management Agencies Association and BACWA are active participants. This program encourages the use of Integrated Pest Management practices as alternatives to use of chemical pesticides. County Household

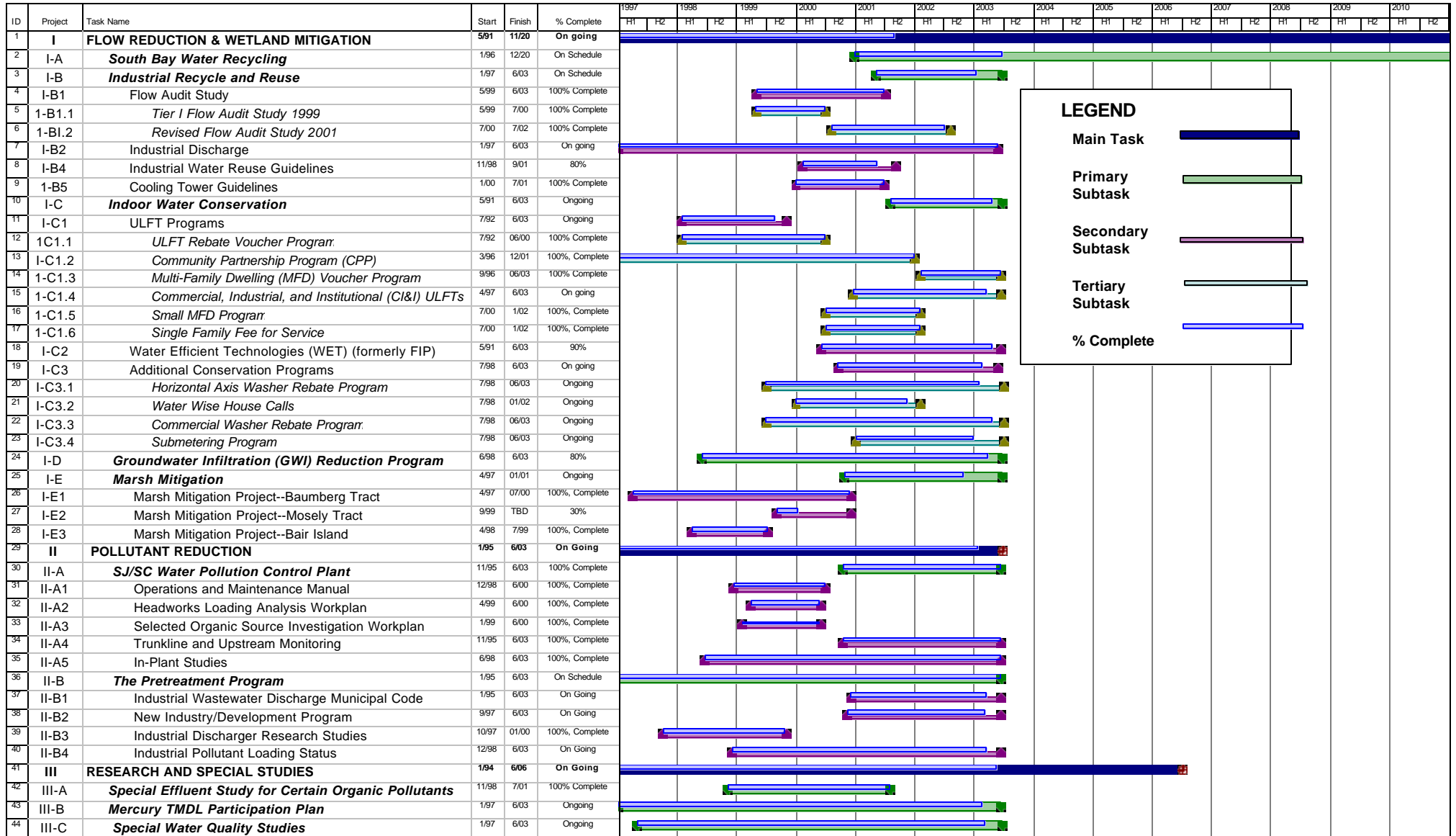
Hazardous Waste staff worked with local hardware stores to ensure that “Our Water, Our World” fact sheets, and the less-toxic products recommended by them, are available to shoppers. BASMAA and BACWA are also active members of the Regional Media Relations Group that uses radio, television and the print media to educate the public about integrated pest management practices. Watershed Watch radio ads ran during this reporting period and the Household Hazardous Waste Program distributed over 200,000 diazinon informational door hangers.

Routine sampling for pesticides and selected organic pollutants is done as part of the Plant’s self-monitoring requirements as well as other monitoring locations throughout the South Bay. Such sampling will continue.

APPENDIX A

CLEAN BAY STRATEGY TIMELINE

CLEAN BAY STRATEGY TIMELINE
as of June 30, 2003



LEGEND

Main Task



Primary Subtask



Secondary Subtask



Tertiary Subtask



% Complete



CLEAN BAY STRATEGY TIMELINE
as of June 30, 2003

ID	Project	Task Name	Start	Finish	% Complete	1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010	
						H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2
45	III-C1	Trace Level Monitoring in S San Francisco Bay	1/99	6/03	On Going																												
46	III-C2	Calcs for TMDL for Cu and Ni in S San Francisco Bay	2/99	6/03	On Going																												
47	III-C2.1	Provide Work Plan for Cu Ni Site Specific Objectives	10/00	2/01	100%																												
48	III-C2.2	Implement Copper Action Plan	TBD	TBD	TBD																												
49	III-C2.3	Implement Nickel Action Plan	TBD	TBD	TBD																												
50	III-C2.4	Implement Work Plan for Cu Ni Site Specific Objectives	TBD	TBD	TBD																												
51	III-D	Salt Marsh Conversion Assessment	11/98	11/99	100%, Complete																												
52	III-E	Stream Flow Augmentation Pilot Project	6/97	6/04	30%, Delayed																												
53	III-E1	Develop Monitoring Program	TBD	TBD	TBD																												
54	III-E2	Develop Contingency Plan	TBD	TBD	TBD																												
55	III-E3	Initiate Discharge	TBD	TBD	TBD																												
56	III-E4	Establish Discharge Rates	TBD	TBD	TBD																												
57	III-E5	Review Monitoring Reports	TBD	TBD	TBD																												
58	III-F	Wetlands Creation Pilot Project	6/97	5/02	0%, Delayed																												
59	III-G	Avian Botulism	1/99	06/03	Ongoing																												
60	III-H	Local Effects Monitoring	1/99	4/99	0%, Discontinued																												
61	III-I	Bioassessment of South Bay	09/01	01/06	On Going																												
62	IV	REGIONAL COOPERATIVE EFFORTS	1/93	1/04	On Going																												
63	IV-A	Urban Runoff Management Program	3/97	6/03	On Going																												
64	IV-B	Watershed Management Initiative	6/96	6/03	On Going																												
65	IV-C	Watershed Grant Agreements	1/97	6/03	On going																												
66	IV-D	Regional Monitoring Program	4/99	06/03	Ongoing																												
67	V	OUTREACH	1/94	6/03	On Going																												
68	V-A	Flow Reduction Public Outreach	5/99	6/03	On Going																												
69	V-A1	South Bay Water Recycling	1/94	6/03	On Going																												
70	V-A2	Indoor Water Conservation Outreach	5/91	6/03	On Going																												
71	V-B	Pollutant Reduction Outreach	6/91	6/03	On Going																												
72	V-B1	Regional Outreach	5/94	6/03	On Going																												
73	V-B2	General Outreach	5/94	6/03	On Going																												
74	V-B2.1	Residential Outreach	5/94	6/03	On Going																												
75	V-B2.2	ESD Web Site	5/99	6/00	100%, Complete																												
76	V-B2.2A	ESD Website Update	6/00	06/03	Ongoing																												
77	V-B2.3	Plant Tours	5/99	06/03	On Hold																												
78	V-B2.4	Outreach Assessment	5/99	06/03	On Going																												
79	V-B3	Targeted Outreach	6/91	6/03	On Going																												
80	V-B3.1	Non-Native Speaking Audiences	5/94	06/03	Ongoing																												
81	V-B3.2	School and Youth Outreach	5/94	6/03	On Going																												
82	V-B4	Commercial and Industrial Outreach	8/91	06/03	On Going																												
83	V-B4.1	Industrial User (IU) Academy	1/99	6/03	On Going																												
84	V-B4.2	Industrial User (IU) Newsletter Survey	1/99	1/00	100%, Complete																												
85	V-B4.3	Specialized BMPs and Materials	12/98	10/99	100%, Complete																												

APPENDIX B

COPPER AND NICKEL ACTION PLAN REFERENCE

Copper Action Plan / Nickel Action Plan Reference Table

CAP/NAP Baseline Activity Number	CBS Report Location
CB-13 – Track POTW Pretreatment Program efforts and POTW loadings.	Pollutant Prevention & Minimization Program: Copper and Nickel Section – Copper Action Plan
CB-14 – Track and encourage water recycling efforts.	South Bay Action Plan: Water Efficiency Program, South Bay Water Recycling, Industrial Water Recycling/Reuse
CB-17 – Track and encourage the investigation of several important topics that influence uncertainty with Lower South Bay Impairment Decision.	Pollutant Prevention & Minimization Program: Copper and Nickel Section - Bioassessment Studies
CB-19 – Track industrial virtual closed-loop wastewater efficiency measures as part of POTW Source Control programs.	South Bay Action Plan: Industrial Recycling/Reuse - Water Efficient Technologies

APPENDIX C

FACT SHEETS FOR REDUCING CORROSION OF COPPER PIPES

Good Plumbing Practices Protect San Francisco Bay

A Fact Sheet for Installers / Plumbers

Copper Affects the Bay

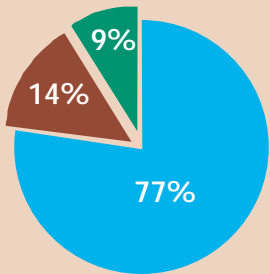
Copper enters San Francisco Bay through storm drains and from wastewater discharged from wastewater treatment plants. Copper is acutely toxic to plankton and affects the reproduction and growth of shellfish.

Much of the copper entering San Francisco Bay (about 77%) passes through storm drains and goes into the Bay untreated. The rest comes from wastewater, which moves from sewers through wastewater treatment plants and is discharged to the Bay.

All Bay Area wastewater treatment plants have permits to discharge into the Bay. These permits strictly limit copper discharges. Many permits also require pollution prevention programs to reduce copper — this is where plumbers come into play.

Of the 23% of copper from treated wastewater, about 60% is estimated to be from copper pipe corrosion. While that might seem like a small portion of the overall problem, copper from pipe corrosion is one source that can be easily reduced.

Typical Breakdown of Bay Copper Sources



- stormwater sources
- wastewater: pipe corrosion
- wastewater: all other sources

* Based on calculations for South San Francisco Bay, south of the Dumbarton Bridge.

Reducing Pipe Corrosion Reduces Copper to the Bay

Your skilled installation techniques can greatly reduce pipe corrosion and help protect the Bay. Here are some ways you can make a difference:

BEST MANAGEMENT PRACTICES

Follow the installation techniques specified by the ASTM B828 and the Copper Development Association in its Application Data Sheet for “soldering and brazing copper tube and fittings.”

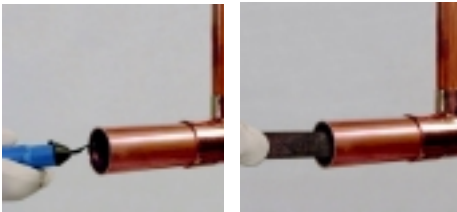
SYSTEM DESIGN

Design each plumbing system to:

1. Minimize velocity
2. Minimize hot water temperature
3. Avoid stagnant sections
4. Minimize direction and size changes

CAREFUL REAMING

Eliminate small burrs created from pipe cutting. This reduces turbulence and significantly decreases corrosion.

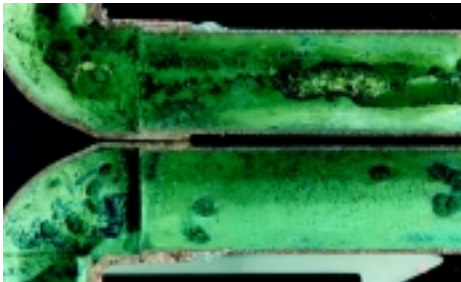
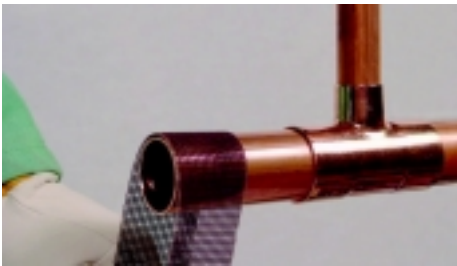


PROTECTED STORAGE

Protect stored pipe from weather and damage so that installed pipe is as clean as possible.

THOROUGH CLEANING

Remove all oxides, debris, and surface soil from tube ends.



Pitting in 6-year-old cold water pipe caused by excess flux at solder joint.

IMMEDIATE AND REGULAR FLUSHING

Newly installed systems should be flushed soon after completion to remove excess flux and debris. For inactive systems, repeat flushing periodically.

MINIMIZE FLUX USE

Avoid excess use of flux to protect both your health and the Bay. Excess flux residue can increase pipe corrosion which leads to copper discharges to the Bay. Warning: Flux is harmful if carried to the eyes, mouth, or open cuts. Some fluxes also absorb through the skin. Wear protective equipment.

Less Corrosive Fluxes

The ASTM B813 flux standard limits flux corrosivity and requires that the flux be water flushable. While these are voluntary standards, the Copper Development Association encourages architects, engineers, contractors and building officials to specify and require the use of B813 fluxes.

All flux manufacturers make a B813 flux. B813 fluxes commonly available in California include:

- Everflux
- Harris Bridget
- Sterling
- Fry's Fire Eater
- LaCo Ultimate B813 Flux

Photo credits: (1) Copper Development Assoc., Application Data Sheet: Copper, Brass, Bronze; Soldering and Brazing Copper Tube and Fittings A1143-00/98. (2) Lewis, Richard, "A White Paper Review: History of Use and Performance of Copper Tube for Potable Water Service," Washington Suburban Sanitary Commission, 1999.



Bay Area Clean Water Agencies
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www.bacwa.org



BAY AREA POLLUTION PREVENTION GROUP

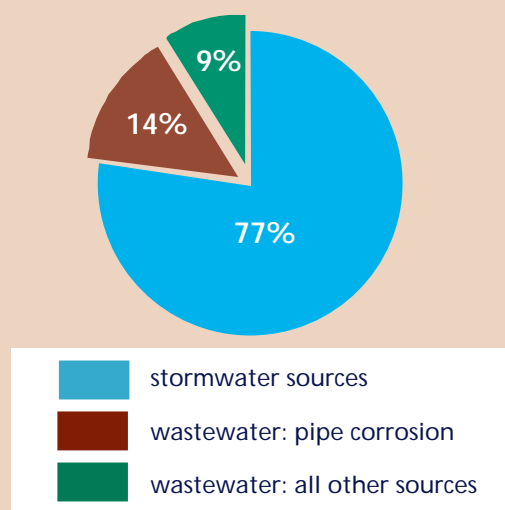
Preventing Corrosion Protects San Francisco Bay

A Fact Sheet for Designers

Copper Sources to the Bay

Like other heavy metals that accumulate in the Bay, excessive amounts of copper have a negative environmental impact. Copper enters the Bay via storm drains and discharge from wastewater treatment plants (see pie chart below). In South San Francisco Bay, about 77 percent of copper is from stormwater sources, while 23 percent is from wastewater treatment plants. Of that wastewater component, 60 percent is believed to be from copper pipe corrosion.⁽¹⁾

Typical Breakdown of Bay Copper Sources



**Calculations based on data for South San Francisco Bay, south of the Dumbarton Bridge.*

Environmental Consequences

Copper is acutely toxic to plankton. Copper also accumulates in clam tissue, affecting reproduction, development, and growth. Because copper and other heavy metals affect these and other Bay species, they can upset the natural balance of species.

Wastewater Discharge Consequences

All Bay Area wastewater treatment plants receive permits to discharge to the Bay. These permits strictly limit copper in wastewater effluent. Many permits also require industrial and commercial pollution prevention programs to reduce copper discharges to the Bay.

Designers Are Part of the Solution!

Plumbing engineers and system designers can significantly reduce pipe corrosion by making simple design adjustments. The techniques listed below reduce pipe corrosion and help protect San Francisco Bay.⁽¹⁾

1. Minimize velocity
2. Minimize hot water temperature
3. Specify low-corrosivity water-flushable fluxes
4. Avoid stagnant sections
5. Minimize direction and size changes

For further details regarding design methods to reduce corrosion, see the back of this fact sheet.



Pitting in 6-year-old cold water pipe caused by excess flux at solder joint. (2)

Less Corrosive Fluxes

The ASTM B813 flux standard limits flux corrosivity and requires that the flux be water flushable. While these are voluntary standards, the Copper Development Association encourages architects, engineers, contractors and building officials to specify and require the use of B813 fluxes.

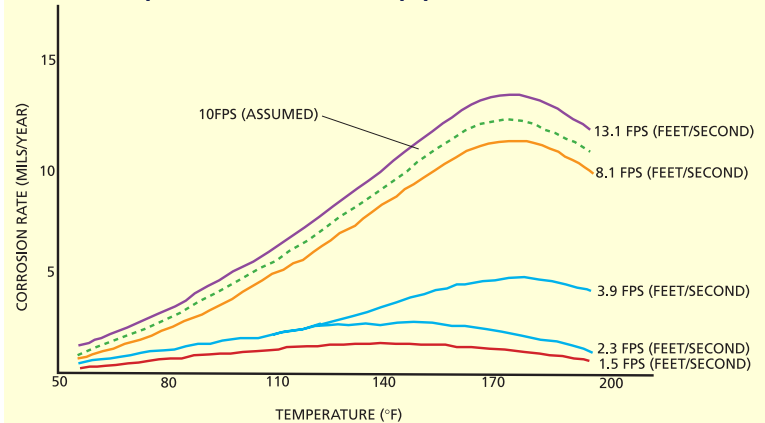
All flux manufacturers make a B813 flux. B813 fluxes commonly available in California include:

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- Harris Bridget
- Sterling
- Fry's Fire Eater
- LaCo Ultimate B813 Flux

More Ways to Prevent Corrosion and Protect the Bay

- Use larger diameter piping to keep velocities low: cold line velocity < 8 ft/s; hot lines < 4-5 ft/s.
- Make sure return lines in a circulating hot water system have the same diameter as the supply lines.
- Avoid stagnant sections; minimize direction and size changes.
- Use compatible materials. When multiple materials do need to be joined, specify insulating unions. Specify copper or brass straps for supporting copper pipe.
- Prevent electrical currents by grounding directly to a copper rod driven into the earth. Do not attach a grounding wire to water pipes. Route wires away from water pipes and don't use galvanized nails that touch copper piping.
- Avoid induced stresses - provide enough pipe support and allow for thermal expansion.
- Consider non-copper pipe (e.g., PEX or stainless steel) where its use is permitted.
- Specify non- or low-lead faucets, valves and appurtenances. Use low flow fixtures and appliances and aeration faucet outlets.
- Specify fluxes that meet ASTM B813 standard. (3)
- Specify that copper tube and fittings be installed according to ASTM B828-92. (4)
- Emphasize careful reaming of cut ends in order to reduce turbulence. Plumbing inspectors and the Copper Development Association both report that unreamed tubing corrodes and fails much more quickly than tubing which is properly reamed.
- Emphasize correct use of ASTM B813 fluxes. Using excess flux or a corrosive flux cause early pipe failures.
- Use stainless steel piping and components for industrial process water supplies, heat exchangers, chillers, condensers when operating temperatures exceed 140°F.
- Incorporate coupons or easy-access inspection points into long stretches of pipe to simplify corrosion monitoring.
- Provide flanged fittings or unions for pumps and

Physical factors, such as flow velocity and water temperature, affect the pipe corrosion rate. (5)



other devices that must be removed for maintenance. This reduces soldering to aged pipe.

References

1. Barron, Thomas, "Guidelines for Designers, Installers, and Owners of Copper Piping Systems" prepared for the City of Palo Alto, August 2001. Available at www.city.palo-alto.ca.us/cleanbay/pdf/cuguidelines.pdf
2. Lewis, Richard, "A White Paper Review: History of Use and Performance of Copper Tube for Potable Water Service," Washington Suburban Sanitary Commission, 1999.
3. ASTM B813-93, "Standard Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube."
4. ASTM B828-92, "Standard Practices for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings."
5. Yeager, Thomas, "Copper Corrosion Reductions Associated with the Design and Construction Practices of Piping Systems, Heating Systems, Cooling Systems, and Hot Water Circulating Systems," Kennedy/Jenks Consultants, Final Report to City of Palo Alto and City of San Jose, June 1995, Page 4-19.



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**BAY AREA POLLUTION
PREVENTION GROUP**

05/2003-RWQCP-2500c